

# Paola Cappellaro

KEPCO Professor of Nuclear Science and Engineering  
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## Education

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### **Massachusetts Institute of Technology, Cambridge, MA (2001–2006)**

- Ph.D. in Nuclear Science and Engineering. GPA: 5.0/5.0
- Advisor: Prof. David Cory  
Dissertation title: Quantum Information Processing in Multi-Spin Systems.

### **École Centrale Paris, Paris, France (1997-2001)**

- M.S. in Applied Physics (TIME double degree program).

### **Politecnico di Milano, Milan, Italy (1995–2000)**

- Laurea (B.S./M.S.) in Nuclear Engineering, 100/100 Summa cum Laude.
- Advisors: Prof. A. Foglio Para, Dr. T. Otto. M.S. Thesis title: Neutron spectra analysis for the validation of the dosimetric calibration in CERN facilities.

## Research and Professional Experience

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### **Massachusetts Institute of Technology, Cambridge, MA**

- Professor of Physics (July 2020 - Present)
- KEPCO Professor of Nuclear Science and Engineering (July 2020 - Present)
- Associate Professor (with tenure) of Nuclear Science and Engineering (July 2016-July 2020)
- Esther and Harold E. Edgerton Career Development Chair Associate Professor of Nuclear Science and Engineering (July 2013-June 2016)
- Assistant Professor of Nuclear Science and Engineering (September 2009-June 2013)  
*Head of the Quantum Engineering Group at the Research Laboratory for Electronics*

### **Shinshu University, (Nagano, Japan)**

- Visiting Professor (2014-2015)

### **Harvard University Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP)**

- Scientific Board (2013-Present)

### **European Laboratory for Non-linear Spectroscopy, Florence (Italy)**

- Visiting Scientist (2013-Present)

### **Canadian Institute for Advanced Research (CIFAR)**

- Quantum Information Science Program, Associate Fellow (2011-2019)

### **ITAMP (Harvard University), Cambridge, MA**

- Postdoctoral Fellow (2006-2009)
  - *High-sensitivity diamond magnetometer with nanoscale resolution.*
  - *Coherent control of single electron-nuclear spin registers.*
  - *Transport of correlated spin states in linear spin chains.*

### **Massachusetts Institute of Technology, Cambridge, MA**

- Research Assistant. Advisor: Prof. D. Cory (2001-2006)
  - *Entanglement assisted metrology for single nuclear spin measurement.*
  - *Solid State NMR quantum computing.*
  - *Encoded qubit operations in the presence of stochastic noise.*

### **CERN, Geneva, Switzerland (2000)**

- Technical student. Advisors: Prof. A. Foglio Para, Dr. T. Otto
  - *Worked in the Radio Protection group to establish CERN RP calibration laboratory as an ISO-recognized laboratory for neutron dosimeters.*

## **Teaching Experience**

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### **Massachusetts Institute of Technology, Dept. of Nuclear Science and Engineering:**

- Instructor for the graduate (Ph.D. level) subject: "*Quantum Technology and Devices*" (Spring 2020).  
Developed new syllabus with a focus on bridging the discipline between physics and engineering. Developed course materials on MITx (MIT version of edX).
- Developed a module for the MOOC "Nuclear Energy: Science, Systems and Society" on Quantum Engineering, including video lectures and problem sets. The MOOC has run in Spring 2020 and Spring 2021. In 2020 the MOOC attracted ~5000 students, about 250 taking a certificate.
- Instructor for the undergraduate subject: "22.ThT Undergraduate Thesis Tutorial" (Fall 2020, 2021)
- Instructor for the undergraduate subject: "*22.02 Introduction to Applied Nuclear Physics*" (Spring 2010-2013, 2015-17)  
Developed new syllabus, with a greater integration of quantum mechanics and nuclear science. Created interactive simulations of physical concepts distributed online to students. Redacted comprehensive lecture notes published on MIT's Open CourseWare (OCW).  
*Awarded the PAI Outstanding Teacher Award in 2010.*
- Instructor for the graduate (Ph.D. level) subject: "*22.51 Quantum Theory of Radiation Interaction*" (Fall 2009-2016, Spring 2019).  
Developed new syllabus with a focus on open quantum system and coherent control. Attracted students from other departments (Electronic Engineering and Physics).
- Instructor for the graduate (Ph.D. level) subject: "*22.11 Applied Nuclear Physics*" (Fall 2015)

- Instructor for “22.911 Seminar in Nuclear Science and Engineering” (Fall 2010-2014,2016,2019), providing technical and formal feedback on presentation skills. Created an online tool for seminar attendees to provide feedback to the presenters and formulated a new syllabus for the course to provide introductory lectures on scientific presentations and more formal feedback to students.
- Instructor for the graduate (Ph.D. level) subject: "22.101 Applied Nuclear Physics " (Fall 2012)
- Instructor for "22.920 A Hands-On Introduction to Nuclear Magnetic Resonance" (2005)  
Developed syllabus, lecture notes and experiments ranging from liquid-state NMR spectroscopy to magnetic resonance imaging of simple targets. Taught lectures and conducted laboratory.  
*Graduate Teaching Award (MIT School of Engineering)*
- Recitation instructor for "22.51 Interaction of Radiation with Matter" (Prof. D. Cory, 2004)
- Teaching assistant for "22.920 A Hands-On Introduction to Nuclear Magnetic Resonance" (2002)
- Teaching assistant for "22.312 Engineering of Nuclear Reactors" (Prof. M. S. Kazimi, 2001)  
(Award as *Outstanding TA* in the Department of Nuclear Engineering)

## Awards

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Committed to Caring Award (MIT Office of Graduate Education, 2018)  
 Merkator Fellowship, Deutsche Forschungsgemeinschaft, University of Stuttgart (Germany,2014)  
 Distinguished Visiting Professor, Optical devices & Energy Storage Groups, Center for Energy and Environmental Science, Shinshu University (Japan, 2014)  
 Esther and Harold E. Edgerton Career Development Professorship (2013)  
 Air Force Office of Scientific Research Young Investigation Award (2012)  
 PAI Outstanding Teacher Award (MIT student chapter of the American Nuclear Society, 2010)  
 ITAMP Postdoctoral Fellowship (2006-2009)  
 Graduate Teaching Award, MIT School of Engineering (2005)  
 Manson Benedict Fellowship (MIT Department of Nuclear Science and Engineering, 2004)  
 Award as Outstanding TA in the Nuclear Science and Engineering Department (MIT, 2002).  
 Alpha Nu Sigma (MIT honorary branch of the American Nuclear Society, 2002)  
 Fondazione Famiglia Legnanese Fellowship (Milan, 1998)  
 Erasmus Program Grant (1997)

## Service

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- Board member, VAMOS (Virtual AMO Seminar Serie) 2020
- Organizer: Diamond Quantum Sensing workshop @ MIT (2019)
- Subcommittee on the Communication Requirement, MIT (2019-present)

- Program Committee: QCMC 2018 (14<sup>th</sup> International Conference on Quantum Communication, Measurement and Computing (QCMC), Louisiana State University (2018)
- NSE Faculty Mentoring Committee (chair), MIT (2016-Present)
- Faculty Committee on Campus Planning, MIT (2016-2017)
- Graduate Admissions Committee (Chair) Nuclear Science and Engineering, MIT (2016-Present)
- Member, APS Committee on Scientific Publications (2015-2017)
- Associate Editor, Quantum Information Processing, Springer (2015-2017)
- NSE Department Head Search Committee (2015 & 2019)
- Organization Committee: ICAP 2016 (25<sup>th</sup> International Conference on Atomic Physics, Seoul, Korea)
- Organizer: “Rising Stars in Nuclear Science and Engineering Symposium” (April 2015, MIT)
- Member, APS Publication Oversight Committee (2014-2015)
- Scientific Board, ITAMP (Institute for theoretical atomic molecular and optical physics, Harvard University, 2013-Present)
- Editorial Advisory Board, Quantum Measurements and Quantum Metrology (Versita publisher)
- Associate, Canadian Institute for Advanced Research (Cifar), Program in Quantum Information (2011-2019)
- Organizer, “Qubit Enabled Imaging, Sensing, and Metrology” MURI Review Meeting (2013)
- Organizer: “Rising Stars in Nuclear Science and Engineering Symposium” (March 2013, MIT)
- Selection committee, ITAMP postdoctoral fellowship (Harvard University, 2012-2014)
- Organizer, “Qubit Enabled Imaging, Sensing, and Metrology” MURI Kickoff Meeting (2011)
- Member, Center for Ultracold Atoms (CUA) at MIT/Harvard University
- Member, Interdisciplinary Quantum Information Science & Engineering (IQIUSE) program at MIT
- Member, W. M. Keck Foundation Center for Extreme Quantum Information Theory (xQIT) at MIT
- Faculty Search Committee, Nuclear Science and Engineering (2010-2015), Physics (2018-2019) at MIT
- Organizer, “Artificial Atoms in Diamond: From Quantum Physics to Applications” workshop at ITAMP (Harvard University, November 2010)
- Organizer, “Frontiers in Open Quantum Systems and Quantum Control Theory” topical group at ITAMP (Harvard University, Aug 1-14, 2010)
- Nominating committee, APS Topical Group on Quantum Information - American Physical Society (2009)
- Organizer, “Open quantum systems: decoherence and control” workshop at ITAMP (Harvard University, November 2008)
- Referee for Automatica, European Physics Letters, IEEE-TAC, IFAC, Nature, Nature Communications, Nature Quantum Information, Nanoletters, New Journal of Physics, Physical Review A, Physical Review B, Physical Review Letters, Physical Review X, Physics B, Proceedings of the National Academy of Science, Quantum Information Processing, Scientific Reports, Science.
- Reviewer for Army Research Office, National Science Foundation, Israel Science Foundation, U.S.-Israel Bilateral Science Foundation, Netherlands Organisation for Scientific Research (NWO), Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)
- Vice-President, Alpha Nu Sigma, honorary branch of the American Nuclear Society (2004).

## Students Supervised

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- *Thesis advisor, Ph.D.*: Clarice Aiello (2014, Ass. Prof. Caltech), Ashok Ajoy (2016, Ass. Prof. Berkeley), Mo Chen (2019, postdoc Caltech) Alexandre Cooper-Roy (2016, researcher, U. Waterloo), Masashi Hirose (2015), David Layden (2020, staff, IBM quantum), Yixiang Liu (2020, postdoc Harvard), Akira Sone (2019, postdoc Los Alamos), Xuan Wei (2018, staff, IBM Quantum), @ MIT  
Francesco Poggiali (2019, University of Florence, Italy, postdoc U. Munich), Santiago Hernandez-Herrera, (2021, University of Florence, Italy)
- *Thesis advisor, Ph.D (ongoing)*: Scott Alsid, Abtin Ameri, Changhao Li, Peng Pai, Calvin Sun, Guoqing Wang, Yuan Zhu @ MIT
- *Thesis reader, Ph.D.*: Thanh Nguyen (expected 2022), Mohamed Abutaleb (2012), Troy Borneman (2012), Edward Chen (2016), Kevin Krsulich (2014), Peisi Le (2016), Sarah Sheldon (2013), Matthew Trusheim (2018), Fei Yan (2013)
- *Thesis Committee, Ph.D.*: Yan Chen (2014), Zhe Wang (2015), Mingda Li (2015), Todd Green (2016, University of Sydney, Australia), Lixin Sun (2017), Cong Su (2019), Emma Rosenfeld, (expected 2021, Physics Department, Harvard University), Hengyun (Harry) Zhou (expected 2022, Physics Department, Harvard University), Zeyang Li (expected 2023, Physics Department, MIT)
- *Thesis advisor, M.S.*: Garry Wolcowitz, (2011 Nano Physics, Ecole Normale Superieure Cachan), Scott T. Alsid (2017), Pai Peng (2019)
- *Thesis advisor, B.S.*: Nicolas Lopez (2015)
- *Undergraduate Students*: Faisall Alsallom, Wenjun Zhang, Louisa Huang, Haoxiong Yan, Jordan Hines, Xiaoyang Huang, Chao Yin, Genyue Liu, Isabelle Phynney, Jonathan Samayoa, Nicolas Lopez, Benjamin Lee, Martin Goycoolea, Margaret Pavlovich, Alex Jaffe

## Postdoctoral Researchers Supervised

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- Dr. Yixiang Liu, Ph.D. MIT (2021)
- Dr. Mo Chen, Ph.D. MIT (2019-2020)
- Dr. Dominika Lyzwa, Ph.D. Goettingen University (2018-2019)
- Dr. Jean-Christophe Jaskula, Ph.D. Université Paris-Sud (2014-2019)
- Dr. Kasturi Saha, Ph.D. Cornell University (2013-2017)
- Dr. Luca Marseglia, Ph.D. Bristol University (2013-2016)
- Dr. Elica Kyoseva, Ph.D. Singapore University of Technology and Design (2013)
- Dr. Ulf Bissbort, Ph.D. Universität Frankfurt (2013-2015)
- Dr. Nicole Fabbri (Visiting Scholar), Ph.D. University of Florence (2012-2013)
- Dr. Honam Yum, Ph.D. Texas A&M, (2011-2013)
- Dr. Easwar Magesan, Ph.D. University of Waterloo (2012-2013)
- Dr. Gurneet Kaur, Ph.D. Universität Stuttgart (2010-2012)

## Patents

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Mikhail D. Lukin, Ronald L. Walsworth, Amir Yacoby, Paola Cappellaro, Jacob M. Taylor, Liang Jiang, Lilian Childress, “*Electronic spin based enhancement of magnetometer sensitivity*”, US Patent No. 8547090

P. Cappellaro, A. Ajoy, “*Stable Three-Axis Nuclear Spin Gyroscope*”, U.S. Patent No. 9417068

P. Cappellaro, A. Cooper, “*Reconstruction of arbitrary temporal profiles of external field with a quantum probe*”, U.S. Patent No. 9,664,767

## Publications

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Google Scholar: <https://scholar.google.com/citations?user=yM9f9mAAAAAJ>

ResearchID: [B-1413-2010](#)

### Articles in refereed journals and preprints

1. P. Peng, C. Yin, X. Huang, C. Ramanathan and P. Cappellaro, “*Observation of Floquet prethermalization in dipolar spin chains*” *Nature Physics* 17 (4), 444-447 (2020)
2. M. Chen, C. Li, G. Palumbo, Y.-Q. Zhu, N. Goldman, P. Cappellaro, “*Experimental characterization of the 4D tensor monopole and topological nodal rings*”, [arxiv.org:2008.00596](https://arxiv.org/abs/2008.00596) (under review in Science)
3. Changhao Li, Tianyi Li, Yi-Xiang Liu, Paola Cappellaro, “*Effective routing design for remote entanglement generation on quantum networks*”, *npj Quantum Information* 7 (1), 1-12 (2020)
4. P Peng, X Huang, C Yin, L Joseph, C Ramanathan, P Cappellaro, “*Deep reinforcement learning for quantum Hamiltonian engineering*” arXiv preprint arXiv:2102.13161 (submitted to PRX)
5. G Wang, YX Liu, Y Zhu, P Cappellaro, “*Nanoscale vector AC magnetometry with a single nitrogen-vacancy center in diamond*”, arXiv preprint arXiv:2103.12044 (to appear in Nano Letters)
6. G. Wang, Y.X. Liu, P. Cappellaro, “*Coherence protection and decay mechanism in qubit ensembles under concatenated continuous driving*”, *New J. of Phys.* 22 (12), 123045 (2020)
7. Rojkov, D Layden, P Cappellaro, J Home, F Reiter, “*Bias in error-corrected quantum sensing*”, arXiv:2101.05817 (2021)
8. G. Wang, Y.X. Liu, P. Cappellaro, “*Observation of high-order Mollow triplet by quantum mode control with concatenated continuous driving*” *Physical Review A* 103 (2), 022415 (2021)
9. D. Layden, M. Chen and P. Cappellaro, “*Efficient quantum error correction of dephasing induced by a common fluctuator*”, *Phys. Rev. Lett.* 124, 020504 (2020)
10. C. M. Sánchez, A. K. Chattah, K. X. Wei, L. Buljubasich, P. Cappellaro and H. M. Pastawski, “*Emergent perturbation independent decay of the Loschmidt echo in a many-spin system studied through scaled dipolar dynamics*”, *Phys. Rev. Lett.* 124, 030601 (2020)
11. A. Cooper, W. K. C. Sun, J.-C. Jaskula, P. Cappellaro. “*Spectral identification of electron-nuclear spin defects in diamond*”, *Phys. Rev. Lett.* 124, 083602 (2020)

12. H. Zhou, J. Choi, S. Choi, R. Landig, A. M. Douglas, J. Isoya, F. Jelezko, S. Onoda, H. Sumiya, P. Cappellaro, H. S. Knowles, H. Park, M. D. Lukin, "Quantum Metrology with Strongly Interacting Spin Systems", *Phys. Rev. X* **10**, 031003 (2020)
13. A. Sone, Y.-X. Liu and P. Cappellaro, "Quantum Jarzynski equality in open quantum systems from the one-time measurement scheme", *Phys. Rev. Lett.* **125**, 060602 (2020)
14. S. Hernandez-Gomez, S. Gherardini, F. Poggiali, F. S. Cataliotti, A. Trombettoni, P. Cappellaro, and N. Fabbri, "Experimental test of exchange fluctuation relations in an open quantum system" *Phys. Rev. Research* **2**, 023327 (2020)
15. W. K. C. Sun, A. Cooper and P. Cappellaro, "Improved entanglement detection with subspace witnesses", *Phys. Rev. A* **101**, 012319 (2020)
16. C. Yin, P. Peng, X. Huang, C. Ramanathan and P. Cappellaro, "Prethermal quasiconserved observables in Floquet quantum systems", [arXiv:2005.11150](https://arxiv.org/abs/2005.11150) (2020), To appear in *Phys. Rev. B*
17. Y-X Liu, J. Hines, A. Ajoy and P. Cappellaro, "Novel Trotter formulas for digital quantum simulation" *Phys. Rev. A* (Rapid Communication) **102**, 010601 (2020)
18. Y. Wang, D. Dong, A. Sone, I. R. Petersen, H. Yonezawa, P. Cappellaro. "Quantum Hamiltonian Identifiability via a Similarity Transformation Approach and Beyond", *IEEE TAC* **65**, 4632-4647, (2020)
19. D. Layden, L. R. Huang and P. Cappellaro, "Robustness-optimized quantum error correction", *Quantum Science and Technology* **5**, 025004 (2020)
20. C. Li, M. Chen, D. Lyzwa, P. Cappellaro, "All-optical quantum sensing of rotational Brownian motion of magnetic molecules", *Nano Lett.*, **19**, 10, 7342-7348 (2019)
21. K. X. Wei, P. Peng, O. Shtanko, I. Marvian, S. Lloyd, C. Ramanathan and P. Cappellaro, "Emergent prethermalization signatures in out-of-time ordered correlations", *Phys. Rev. Lett.* **123**, 090605 (2019)
22. Y. Liu, A. Ajoy, P. Cappellaro, "Nanoscale vector DC magnetometry via ancilla assisted frequency up-conversion", *Phys. Rev. Lett.* **122**, 100501 (2019)
23. D. Layden, S. Zhou, P. Cappellaro and L. Jiang, "Ancilla-free quantum error correction codes for quantum metrology" *Phys. Rev. Lett.* **122**, 040502 (2019)
24. A. Ajoy, U. Bissbort, D. Poletti and P. Cappellaro, "Selective Decoupling and Hamiltonian Engineering in Dipolar Spin Networks", *Phys. Rev. Lett.* **122**, 013205 (2019)
25. A. Cooper, W. K. C. Sun, J.-C. Jaskula and P. Cappellaro, "Environment-assisted quantum-enhanced sensing with electronic spins in diamond", *Phys. Rev. App.*, **12**, 044047 (2019)
26. J.-C. Jaskula, K. Saha, A. Ajoy, D. J. Twitchen, M. Markham, P. Cappellaro, "Cross-sensor feedback stabilization of an emulated quantum spin gyroscope", *Phys. Rev. Applied* **11**, 054010 (2019)
27. P. Peng, Z. Li, H. Yan, K. X. Wei and P. Cappellaro, "Comparing many-body localization lengths via non-perturbative construction of local integrals of motion" *Phys. Rev. B* **100**, 214203 (2019), Editors' Suggestion.
28. A. Sone, Q. Zhuang, C. Li, Y.-X. Liu and P. Cappellaro, "Nonclassical correlations for quantum metrology in thermal equilibrium", *Phys. Rev. A* **99**, 052318 (2019)
29. S. T. Alsid, J. F. Barry, L. M. Pham, J. M. Schloss, M. F. O'Keeffe, P. Cappellaro and D. A. Braje, "Photoluminescence decomposition analysis: A technique to characterize N-V creation in diamond", *Phys. Rev. App.*, **12** 044003 (2019)

30. C. Li and P. Cappellaro, "Telecom photon interface of solid-state quantum node", *J. Phys. Commun.* **3**, 095016 (2019).
31. G. Liu, M. Chen, Y.-X. Liu, D. Layden, P. Cappellaro, "Repetitive Readout Enhanced by Machine Learning", *Mach. Learn.: Sci. Technol.* **1** 015003 (2019)
32. L. Marseglia, K. Saha, A. Ajoy, T. Schröder, D. Englund, F. Jelezko, R. Walsworth, J. L. Pacheco, D. L. Perry, E. S. Bielejec and P. Cappellaro, "Bright nanowire single photon source based on SiV centers in diamond", *Optics Express* **26**, 80-89 (2018)
33. M. Hirose and P. Cappellaro, "Time-optimal control with finite bandwidth", *Quantum Inf. Process.* **17**, 88 (2018)
34. M. Chen, W. K. C. Sun, K. Saha, J.-C. Jaskula and P. Cappellaro, "Protecting solid-state spins from strongly coupled environment", *New J. Phys.* **20**, 063011 (2018)
35. C. X. Wei, C. Ramanathan and P. Cappellaro, "Exploring Localization in Nuclear Spin Chains", *Phys. Rev. Lett.* **120**, 070501 (2018)
36. D. Layden and P. Cappellaro, "Spatial noise filtering through error correction for quantum sensing", *Nature Partner Journal Quantum Information* **4**, 30 (2018)
37. F. Poggiali, P. Cappellaro and N. Fabbri, "Optimal control for one-qubit quantum sensing", *Phys. Rev. X* **8**, 021059 (2018)
38. A. Sone, Q. Zhuang, P. Cappellaro, "Quantifying precision loss in local quantum thermometry via diagonal discord" *Phys. Rev. A* **98**, 012115 (2018)
39. S. Hernández-Gómez, F. Poggiali, P. Cappellaro and N. Fabbri, "Noise spectroscopy of a quantum-classical environment with a diamond qubit", *Phys. Rev. B* **98**, 214307 (2018)
40. A. Ajoy, Y. X. Liu, K. Saha, L. Marseglia, J.-C. Jaskula, U. Bissbort and P. Cappellaro, "Quantum Interpolation for High Resolution Sensing", *Proc. Nat. Acad. Sc.* **114**, 2149-2153 (2017)
41. A. Sone and P. Cappellaro, "Hamiltonian identifiability assisted by a single-probe measurement", *Phys. Rev. A* **95**, 022335 (2017)
42. F. Poggiali, P. Cappellaro and N. Fabbri, "Measurement of the excited-state transverse hyperfine coupling in NV centers via dynamic nuclear polarization", *Phys. Rev. B* **95**, 195308 (2017)
43. C. L. Degen, F. Reinhard and P. Cappellaro, "Quantum sensing", *Rev. Mod. Phys.* **89**, 035002 (2017)
44. A. Sone and P. Cappellaro, "Exact dimension estimation of interacting qubit systems assisted by a single quantum probe", *Phys. Rev. A* **96**, 062334 (2017)
45. M. Hirose and P. Cappellaro, "Coherent feedback control of a single qubit in diamond", *Nature*, **532**, 77-80 (2016).
46. L. M. Pham, S. J. DeVience, F. Casola, I. Lovchinsky, A. O. Sushkov, E. Bersin, J. Lee, E. Urbach, P. Cappellaro, H. Park, A. Yacoby, M. Lukin and R. L. Walsworth, "NMR Technique for Determining the Depth of Shallow Nitrogen-Vacancy Centers in Diamond", *Phys. Rev. B* **93**, 045425 (2016).
47. A. Ajoy, U. Bissbort, D. Lukin M. L. Walsworth R. and P. Cappellaro, "Atomic-Scale Nuclear Spin Imaging Using Quantum-Assisted Sensors in Diamond", *Phys. Rev. X* **5**, 011001 (2015).
48. C. D. Aiello and P. Cappellaro, "Time-optimal control by a quantum actuator", *Phys. Rev. A* **91**, 042340 (2015).
49. M. Chen, M. Hirose and P. Cappellaro, "Measurement of transverse hyperfine interaction by forbidden transitions", *Phys. Rev. B* **92**, 020101 (2015).



50. C. D. Aiello, M. Allegra, B. Hemmerling, X. Wan and P. Cappellaro, "Algebraic synthesis of time-optimal unitaries in SU(2) with alternating controls", *Quantum Inf. Process.* **14**, 3233-3256 (2015).
51. K. Arai, C. Belthangady, H. Zhang, N. Bar-Gill, S. DeVience, P. Cappellaro, A. Yacoby and R. Walsworth, "Fourier magnetic imaging with nanoscale resolution and compressed sensing speed-up using electronic spins in diamond", *Nat. Nano* **10**, 859-864 (2015).
52. P. Cappellaro, "Polarizing Nuclear Spins in Silicon Carbide", *Physics*, 56 (2015).
53. A. Cooper, E. Magesan, H. Yum and P. Cappellaro, "Time-resolved magnetic sensing with electronic spins in diamond", *Nat. Commun.* **5**, 3141 (2014).
54. C. D. Aiello, M. Hirose and P. Cappellaro, "Composite-pulse magnetometry with a solid-state quantum sensor", *Nat. Commun.* **4**, 1419 (2013).
55. A. Ajoy and P. Cappellaro, "Perfect quantum transport in arbitrary spin networks", *Phys. Rev. B* **87**, 064303 (2013).
56. C. Belthangady, N. Bar-Gill, L. M. Pham, K. Arai, D. Le Sage, P. Cappellaro and R. L. Walsworth, "Dressed-State Resonant Coupling between Bright and Dark Spins in Diamond", *Phys. Rev. Lett.* **110**, 157601 (2013).
57. A. Ajoy and P. Cappellaro, "Quantum simulation via filtered Hamiltonian engineering: application to perfect quantum transport in spin networks", *Phys. Rev. Lett.* **110**, 220503 (2013).
58. E. Magesan and P. Cappellaro, "Experimentally efficient methods for estimating the performance of quantum measurements", *Phys. Rev. A* **88**, 022127 (2013).
59. E. Magesan, A. Cooper, H. Yum and P. Cappellaro, "Reconstructing the profile of time-varying magnetic fields with quantum sensors", *Phys. Rev. A* **88**, 032107 (2013).
60. G. Kaur, A. Ajoy and P. Cappellaro, "Decay of spin coherences in one-dimensional spin systems", *New J. Phys.*, **15**, 093035 (2013).
61. E. Magesan, A. Cooper and P. Cappellaro, "Compressing measurements in quantum dynamic parameter estimation", *Phys. Rev. A* **88**, 062109 (2013).
62. P. Cappellaro, G. Goldstein, J. S. Hodges, L. Jiang, J. R. Maze, A. S. Sørensen and M. D. Lukin, "Environment-assisted metrology with spin qubits", *Phys. Rev. A* **85**, 032336 (2012).
63. P. Cappellaro, "Spin-bath narrowing with adaptive parameter estimation", *Phys. Rev. A* **85**, 030301(R) (2012).
64. A. Ajoy and P. Cappellaro, "Mixed-state quantum transport in correlated spin networks", *Phys. Rev. A* **85**, 042305 (2012).
65. N. Bar-Gill, L. Pham, C. Belthangady, D. Le Sage, P. Cappellaro, J. Maze, M. Lukin, A. Yacoby and R. Walsworth, "Suppression of spin-bath dynamics for improved coherence of multi-spin-qubit systems", *Nat. Commun.* **3**, 858 (2012).
66. L. M. Pham, N. Bar-Gill, C. Belthangady, D. Le Sage, P. Cappellaro, M. D. Lukin, A. Yacoby and R. L. Walsworth, "Enhanced solid-state multispin metrology using dynamical decoupling", *Phys. Rev. B* **86**, 045214 (2012).
67. F. Ticozzi, R. Lucchese, P. Cappellaro and L. Viola, "Hamiltonian Control of Quantum Dynamical Semigroups: Stabilization and Convergence Speed", *IEEE TAC* **57**, 1931 -1944 (2012).
68. G. Kaur and P. Cappellaro, "Initialization and readout of spin chains for quantum information transport", *New J. Phys.* **14**, 083005 (2012).

69. M. Hirose, C. D. Aiello and P. Cappellaro, "Continuous dynamical decoupling magnetometry", *Phys. Rev. A* **86**, 062320 (2012).
70. A. Ajoy and P. Cappellaro, "Stable three-axis nuclear-spin gyroscope in diamond", *Phys. Rev. A* **86**, 062104 (2012).
71. P. Cappellaro, L. Viola and C. Ramanathan "Coherent-state transfer via highly mixed quantum spin chains", *Phys. Rev. A* **83**, 032304 (2011).
72. L. M. Pham, D. Le Sage, P. L. Stanwix, T. K. Yeung, D. Glenn, A. Trifonov, P. Cappellaro, P. R. Hemmer, M. D. Lukin, H. Park, A. Yacoby and R. L. Walsworth, "Magnetic field imaging with nitrogen-vacancy ensembles", *New J. Phys.* **13**, 045021 (2011).
73. G. Goldstein, P. Cappellaro, J. R. Maze, J. S. Hodges, L. Jiang, A. S. Sorensen and M. D. Lukin, "Environment Assisted Precision Measurement", *Phys. Rev. Lett.* **106**, 140502 (2011).
74. C. Ramanathan, P. Cappellaro, L. Viola and D. G. Cory, "Experimental characterization of coherent magnetization transport in a one-dimensional spin system", *New J. Phys.* **13**, 103015 (2011).
75. C. A. Meriles, L. Jiang, G. Goldstein, J. S. Hodges, J. Maze, M. D. Lukin and P. Cappellaro, "Imaging mesoscopic nuclear spin noise with a diamond magnetometer", *J. Chem. Phys.* **133**, 124105 (2010).
76. P. L. Stanwix, L. M. Pham, J. R. Maze, D. Le Sage, T. K. Yeung, P. Cappellaro, P. R. Hemmer, A. Yacoby, M. D. Lukin and R. L. Walsworth, "Coherence of nitrogen-vacancy electronic spin ensembles in diamond", *Phys. Rev. B* **82**, 201201 (2010).
77. G. Goldstein, M. D. Lukin and P. Cappellaro, "Quantum Limits on Parameter Estimation", *ArXiv:1001.4804*, (2010).
78. C. Altafini, P. Cappellaro and D. Cory, "Feedback schemes for radiation damping suppression in NMR: A control-theoretical perspective", *Systems and Control Letters* **59**, 782 - 786 (2010).
79. P. Rabl, P. Cappellaro, M. V. G. Dutt, L. Jiang, J. R. Maze and M. D. Lukin, "Strong magnetic coupling between an electronic spin qubit and a mechanical resonator", *Phys. Rev. B* **79**, 041302 (2009).
80. P. Cappellaro, L. Jiang, J. S. Hodges and M. D. Lukin, "Coherence and Control of Quantum Registers Based on Electronic Spin in a Nuclear Spin Bath", *Phys. Rev. Lett.* **102**, 210502 (2009).
81. P. Cappellaro and M. D. Lukin, "Quantum correlation in disordered spin systems: Applications to magnetic sensing", *Phys. Rev. A* **80**, 032311 (2009).
82. W. Zhang, P. Cappellaro, N. Antler, B. Pepper, D. G. Cory, V. V. Dobrovitski, C. Ramanathan and L. Viola, "NMR multiple quantum coherences in quasi-one-dimensional spin systems: Comparison with ideal spin-chain dynamics", *Phys. Rev. A* **80**, 052323 (2009).
83. L. Jiang, M. V. G. Dutt, E. Togan, L. Childress, P. Cappellaro, J. M. Taylor and M. D. Lukin, "Coherence of an Optically Illuminated Single Nuclear Spin Qubit", *Phys. Rev. Lett.* **100**, 073001 (2008).
84. J. R. Maze, P. L. Stanwix, J. S. Hodges, S. Hong, J. M. Taylor, P. Cappellaro, L. Jiang, A. Zibrov, A. Yacoby, R. Walsworth and M. D. Lukin, "Nanoscale magnetic sensing with an individual electronic spin qubit in diamond", *Nature* **455**, 644-647 (2008).
85. J. M. Taylor\*, P. Cappellaro\*, L. Childress, L. Jiang, D. Budker, P. R. Hemmer, A. Yacoby, R. Walsworth and M. D. Lukin, "High-sensitivity diamond magnetometer with nanoscale resolution", *Nat. Phys.* **4**, 810-816 (2008). \*equal contributions

86. J. S. Hodges, P. Cappellaro, T. F. Havel, R. Martinez and D. G. Cory, "Experimental implementation of a logical Bell state encoding", *Phys. Rev. A* **75**, 042320 (2007).
87. P. Cappellaro, J. S. Hodges, T. F. Havel and D. G. Cory, "Control of qubits encoded in decoherence-free subspaces", *Las. Phys.* **17**, 545-551 (2007).
88. P. Cappellaro, J. S. Hodges, T. F. Havel and D. G. Cory, "Subsystem pseudopure states", *Phys. Rev. A* **75**, 042321 (2007).
89. P. Cappellaro, C. Ramanathan and D. G. Cory, "Dynamics and control of a quasi-one-dimensional spin system", *Phys. Rev. A* **76**, 032317 (2007).
90. P. Cappellaro, C. Ramanathan and D. G. Cory, "Simulations of Information Transport in Spin Chains", *Phys. Rev. Lett.* **99**, 250506 (2007).
91. P. Cappellaro, J. S. Hodges, T. F. Havel and D. G. Cory, "Principles of Control for Decoherence-Free Subsystems", *J. Chem. Phys.* **125**, 044514 (2006).
92. C. A. Perez-Delgado, M. Mosca, P. Cappellaro and D. G. Cory, "Single Spin Measurement Using Cellular Automata Techniques", *Phys. Rev. Lett.* **97**, 100501 (2006).
93. H. J. Cho, P. Cappellaro, D. G. Cory and C. Ramanathan "Decay of highly correlated spin states in a dipolar-coupled solid: NMR study of CaF<sub>2</sub>", *Phys. Rev. B* **74**, 224434 (2006).
94. P. Cappellaro, J. Emerson, N. Boulant, C. Ramanathan, S. Lloyd and D. G. Cory, "Entanglement Assisted Metrology", *Phys. Rev. Lett.* **94**, 020502 (2005).
95. C. Ramanathan, H. Cho, P. Cappellaro, G. S. Boutis and D. G. Cory, "Encoding multiple quantum coherences in non-commuting bases", *Chem. Phys. Lett.* **369**, 311 (2003).
96. G. S. Boutis, P. Cappellaro, H. Cho, C. Ramanathan and D. G. Cory, "Pulse error compensating symmetric magic-echo trains", *J. Mag. Res.* **161**, 132-137 (2003).

### Refereed Conference proceedings

1. S. Hernández-Gómez, F. Poggiali, N. Fabbri, P. Cappellaro, "Environment spectroscopy with an NV center in diamond", *Nanoscale Quantum Optics* 204, 245 (2020)
2. F. Poggiali, S. Hernández-Gómez, P. Cappellaro, and N. Fabbri, "Optimal control of diamond spin qubits for quantum sensing in noisy environments", in Quantum Information and Measurement (QIM) V: *Quantum Technologies, OSA*, S3C.2. (2019)
3. S. Zhou, D. Layden, M. Zhang, J. Preskill, P. Cappellaro and L. Jiang, "Error-corrected quantum sensing", In *Proceedings of SPIE Optical, Opto-Atomic, and Entanglement-Enhanced Precision Metrology*, Volume 10934, 1J (2019)
4. L. Marseglia, K. Saha, A. Ajoy, T. Schroder, D. R. Englund, T. Tearji, J. Isoya, F. Jelezko, R. Walsworth, J. L. Pacheco, D. Perry, E. Bielejec, and P. Cappellaro, "A bright nanowire single photon source", in Conference on *Lasers and Electro-Optics*, FTu3D.1. (2016)
5. J. R. Maze, P. Cappellaro et al., "Nanoscale magnetic sensing using spin qubits in diamond", *Proc. SPIE*, Vol. 7225, 722509 (2009)
6. C. Altafini, P. Cappellaro, D. G. Cory, "Feedback schemes for radiation damping suppression in NMR: a control-theoretical perspective", 48th IEEE Conference on Decision and Control (2009)
7. P. Cappellaro, J. R. Maze, L. Childress, G. Dutt, J. S. Hodges, S. Hong, L. Jiang, P. L. Stanwix, J. Taylor, E. Togan, A. S. Zibrov, P. R. Hemmer, A. Yacoby, R. L. Walsworth, and M. D. Lukin, "Quantum Control of Spins and Photons at Nanoscales", *Proceedings of the XXI International Conference on Atomic Physics, ICAP*, (2008)

8. J.S. Hodges, P. Cappellaro, T.F. Havel and D. G. Cory, "Quantum Control of Nuclear Spins", 45th IEEE Conference on Decision and Control, 2488-2494 (2006)
9. H. Cho, P. Cappellaro, C. Ramanathan and D. G. Cory, "Experimental investigation on decay and control of multiple spin correlations", in Proceedings of the 47<sup>th</sup> Experimental Nuclear Magnetic Resonance Conference, Pacific Grove, CA, (2006).
10. T.F. Havel, P. Cappellaro, C. Ramanathan and D.G. Cory, "Quantum Information Processing with Nuclear Spin-Based Devices" *Nanotech* **3**, 161 – 164 (2005). Technical Proceedings of the 2005 NSTI Nanotechnology Conference and Trade Show.
11. P. Cappellaro, J. Emerson, N. Boulant, C. Ramanathan, S. Lloyd and D. Cory "Spin Amplifier for Single Spin Measurement" in " Quantum Computation: solid state systems", Kluwer Academic Plenum Pub. (2005)
12. Ramanathan, H. Cho, P. Cappellaro, G. Boutis and D. Cory, "Exploring large nuclear spin systems in the solid state using NMR", in Proceedings of the 6th International Conference on Quantum Communication, Measurement and Computing., Cambridge, MA, 267-270 (2003)
13. C. Birattari, P. Cappellaro, A. Mitaroff, M. Silari, "Development of an Extended Range Bonner Sphere Spectrometer" in "Advanced Monte Carlo for Radiation Physics, Particle Transport Simulation and Applications" (Springer-Verlag 2001)

### Book chapters

P. Cappellaro, "*Implementation of state transfer Hamiltonians in spin chains with magnetic resonance techniques*", in "Quantum State Transfer and Quantum Network Engineering" (Springer 2014)

### Presentations

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- July 2020, Munich Conference on Quantum Science and Technology 2020, Invited talk
- November 2019, "How to avoid chaotic discussions among your spins", Quantum Gravity in the Lab Workshop, Google X (Palo Alto, CA)
- October 2019, Physics Colloquium, Dartmouth College
- September 2019, Quantum Control workshop, (Seoul, Korea), Invited talk
- July 2019, "Localization and Thermalization in Nuclear Spin Chains", program on "Breakdown of Ergodicity in Isolated Quantum Systems: From Glassiness to Localization", Galileo Galilei Institute (GGI) of Florence, Italy
- June 2019, "Hardware-efficient quantum error correction codes", Invited talk, Workshop on Noisy Intermediate-Scale Quantum Technologies (NISQ), College Park, MD
- June 2019, "Quantum Sensors", Keynote talk, The 16th International Workshop on Nanomechanical Sensors (NMC2019), Lausanne, Switzerland
- May 2019 "Quantum Transport and Localization", Seminar at CUNY, New York, NY
- May 2019, "Error correction for quantum sensing", Invited talk at the 50th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Milwaukee
- April 2019 "Mechanically Driven Coherence Enhanced Quantum Angle Sensors", DARPA Workshop of Driven Quantum Systems, Santa Barbara, CA

- March 2019, “Quantum Transport and Localization”, Winter Conference on 'Many-Body Quantum Chaos', Center for Physics, Aspen, CO
- March 2019, Invited tutorial at APS March Meeting: “Quantum Hybrid Systems” (Boston, MA)
- March 2019, “Localization and Thermalization in Nuclear Spin Chains”, APS March Meeting 2019 (Boston, MA)
- February 2019, “Quantum Metrology”, Quantum Technologies Based on Atom-Like Spin Workshop, Arlington, Virginia
- November 2018, “Quantum Engineering”, Quantum Diamond Sensing Workshop, MIT
- September 2018, Error-corrected quantum sensing, AMOQI seminar Berkeley, CA
- September 2018, Localization and thermalization in many-body nuclear spin systems, Optics and Electronics Seminar, Stanford, CA
- September 2018, Transport and localization in spin systems, IQIM seminar, Caltech, Los Angeles, CA.
- August 2018, Localization and prethermalization in nuclear spin chains, Novel Approaches to Quantum Dynamics, KITP, Santa Barbara, CA
- July 2018, Quantum error correction for sensing, Quantum Science Gordon Research Conference 2018, Stonehill College, MA
- June 2018, Quantum error correction for sensing, QSIT - Quantum Science and Technology 2018, Ascona, Switzerland
- June 2018, Localization and thermalization in many-body nuclear spin systems, CQD Colloquium Heidelberg, Germany
- March 2018, “Exploring localization in nuclear spin chains”, Non-thermal Quantum Systems: glassiness, scrambling, and dynamical control, Boston, MA
- September 2017, Quantum error correction for sensing, QEC 2017: 4th International Conference on Quantum Error Correction, College Park, MD.
- March 2017, Transport and Localization in Many-body Nuclear Spin Systems, CIQM Quantum Materials and Devices Seminar
- February 2017, Quantum Computers and Philosophy of Science, Soap Box Series on Quantum Quandaries and other Heavy Matters, MIT Museum, Cambridge, MA.
- November 2016, “Transport and Localization in many-body nuclear spin systems”, University of Colorado, Boulder, Physics Colloquium.
- November 2016, “Many Body Localization with Nuclear Spins”, KITP Program “Designer Quantum Systems Out of Equilibrium”, Santa Barbara, CA
- July 2016, “Quantum Interpolation”, 58th Rocky Mountain Conference on Magnetic Resonance, Breckenridge, CO.
- July 2016, “Coherent Feedback Control of a Single Qubit in Diamond,” 13th International conference on Quantum Communication, Measurement and Computing, (QCMC), Singapore.
- September 2015, “Magnetic Resonance at the Nanoscale,” Physical Chemistry Seminar, MIT, Cambridge, MA.
- August 2015, “Quantum Spectrometers,” Gordon Conference on Pushing Frontiers in Coherent Quantum Control and Quantum Technologies, Mount Holyoke College South Hadley, MA.

- August 2015, “Fast Control by a Quantum Actuator,” META’15, the 6th International Conference on Metamaterials, Photonic Crystals and Plasmonics, City College of New York, New York City, NY.
- July 2015, “Fast Control by a Quantum Actuator,” 10th Workshop on Principles and Applications of Control in Quantum Systems (PRACQSYS), Sydney (Australia).
- July 2015, “Quantum-Enhanced Nuclear Spin Imaging,” 5<sup>th</sup> Nanoscale Magnetic Resonance Imaging (NanoMRI) Conference (Waterloo, ON Canada).
- April 2015, “Nano-MRI with quantum sensors in diamond,” ANS seminar, MIT.
- April 2015, “Quantum Spectrometers”, NQO Workshop, Belgrade (Serbia)
- April 2015, “Nano-MRI with quantum sensors in diamond”, ANS seminar, MIT
- March 2015, “Fast Control by a Quantum Actuator”, Princeton University
- March 2015, “Control of spin qubit registers in diamond”, SIPQNP (BBN, Cambridge, MA)
- February 2015, “Hamiltonian Filters for Sensing and Simulation” (JQI UMD)
- February 2015, “Quantum control for imaging and spectroscopy”, Umass Colloquium
- January 2015, ITAMP B2 Winter School on Hybrid Quantum Systems (Arizona)
- November 2014, “Time-optimal control with a quantum actuator”, Fall 2014 CIFAR QIS Meeting (Waterloo, Canada)
- November 2014, “Time-optimal control with a quantum actuator”, Fall 2014 INTRIQ (Institut Transdisciplinaire d’Information Quantique) Meeting, Château Bromont (Canada)
- October 2014, Quantum Enabled Imaging Sensing and Metrology (MURI Review, MIT, Cambridge MA)
- October 2014, Centre for Quantum Information and Quantum Control Seminar (Toronto, Canada)
- October 2014, Quantum Innovators Workshop (Waterloo University, Canada)
- September 2014, Echoes in Complex Systems Workshop, Max Plank Institute for Complex Systems (Dresden, Germany)
- August 2014, “Materials for Spin-based Quantum Information Processing” IURMS-ICA 2014 (International Union of Materials Research Society International Conference in Asia) (Fukuoka, Japan) (keynote)
- August 2014, “Materials for Quantum Computing and Sensing”, Shinshu University (Nagano, Japan)
- August 2014, “Quantum Computing with spins”, Shinshu University (Nagano, Japan)
- August 2014, “Quantum control strategies for imaging and spectroscopy”, 24th International Conference on Atomic Physics (ICAP) (invited) (Washington, DC)
- August 2014, “Quantum Sensors”, NIST Maryland
- June 2014, “Controlling quantum spins: Artificial atoms in the solid-state”, Graduate Student Symposium on Hybrid Atomic Systems at DAMOP (Madison, Wisconsin)
- June 2014, “Quantum control for improved metrology”, 45<sup>th</sup> Annual DAMOP Meeting (Division of Atomic, Molecular and Optical Physics of APS) (invited)

- May 2014, “Control of Hybrid Systems for Quantum Computing and Metrology”, Science at ITAMP Symposium, Harvard University (Cambridge, MA)
- April 2014, Istituto Nazionale di Ricerca Metrologica (INRIM), “Control for Quantum Metrology” (Turin, Italy)
- April 2014, Delft Technical University, Quantum Transport Seminar (Delft, The Netherlands)
- April 2014, Quantum Control for efficient metrology, Padua University (Padua, Italy)
- March 2014, Harvard HQOC/ITAMP Seminar “Quantum Control for Efficient Metrology” (Harvard University)
- February 2014, Ulm Universitat, Institut für Quantenoptik seminar (Ulm, Germany)
- February 2014, “Quantum Waveform Estimation” 3. Physikalisches Institut Seminar (Stuttgart, Germany)
- January 2014, “Control of Quantum Sensors” DARPA QuASAR review meeting, Long Beach (CA)
- January 2014, “Quantum Information Devices” IAP Physics Lecture Series (MIT)
- January 2014, “Quantum Waveform Estimation” Quantum/Nano Physics Seminar (Dartmouth)
- November 2013, “Quantum Waveform Estimation” Quantum Information Processing seminar (MIT)
- November 2013, MURI QuISM (Qubit Enabled Imaging, Sensing, and Metrology) review meeting, Massachusetts Institute of Technology, Cambridge, MA
- September 2013, “Quantum metrology”, Army Future Quantum Information Science, Potomoc, VA
- August 2013, “Control of quantum sensors”, Chemistry Department, Berkeley, CA.
- July 2013, “Multi-Qubit Enhanced Sensing and Metrology”, MURI Program Review, Arlington, VA
- July 2013, “Control of quantum sensors”, Quantum Information Processing and Communication (QIPC) International Conference, Florence (Italy)
- May 2013, "Dynamics and quantum information transport in spin chains", ISMAR 2013 (International Society of Magnetic Resonance) Rio de Janeiro (Brazil)
- May 2013, “Control of Quantum Sensors”, PRISM/MITRE QES Seminar, Princeton University
- March 2013, “Control of Quantum Sensors”, New Directions in the Quantum Control Landscape, Kavli Institute for Theoretical Physics, Santa Barbara (CA)
- February 2013, “Stable three-axes gyroscope in diamond”, MURI-QuISM (Qubit Enabled Imaging, Sensing, and Metrology) review meeting, Massachusetts Institute of Technology, Cambridge, MA
- February 2013, “Control of Quantum Sensors”, SFB/TRR Kolloquium, Ulm University (Germany)
- December 2012, “Stable three-axes gyroscope in diamond”, QDIAMOND 12, South Africa
- November 2012, “Building blocks for a scalable quantum computer”, Fall 2012 Joint Meeting of the New England Sections of the American Physical Society and the American Association of Physics Teachers, (Williams College Williamstown, MA)
- October 2012, “Quantum Information transport in spin chains”, (The Graduate Center, CUNY, New York)
- October 2012, “Quantum sensors at the nano-scale”, (LENS-QStar seminar, Florence, Italy)

- September 2012, “Quantum wires for scalable quantum information processing” 5th Italian Quantum Science Conference (IQIS, Padova, Italy)
- August 2012, “Quantum Information Transport in Mixed-State Networks”, 11<sup>th</sup> International conference on Quantum Communication, Measurement and Computing (Vienna, Austria)
- July 2012, “Improved magnetometry by adaptive parameter estimation and spin bath narrowing”, 4<sup>th</sup> NanoMRI Conference (Ascona, Switzerland)
- June 2012, “Practical modeling of decoherence” USEQIP 2012, IQC, University of Waterloo, Waterloo ON, Canada.
- April 2012, “Quantum-Enhanced Diamond Magnetometer”, Theoretical Atomic Physics Seminar, Center for Astrophysics, Cambridge, MA
- April 2012, “Wiring up a Quantum Computer”, Nuclear Science and Engineering Faculty Seminar, Massachusetts Institute of Technology, Cambridge, MA.
- March 2012, “Controlling and Connecting Quantum Registers”, IQuISE lunch seminar, Massachusetts Institute of Technology, Cambridge, MA.
- February 2012, “Updates from the Quantum Engineering Group”, Experimental Atomic Physics Group seminar, Center for Astrophysics, Cambridge, MA.
- January 2012, “Quantum-Enhanced Diamond Magnetometer”, 42nd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT.
- November 2011, “Multi-qubit enhanced sensing and metrology”, MURI-QuISM (Qubit Enabled Imaging, Sensing, and Metrology) kick-off meeting, Massachusetts Institute of Technology, Cambridge, MA
- October 2011, “Building blocks for scalable quantum computation”, Physics Department, RWTH Aachen, Germany.
- September 2011, “Quantum Computing”, 17th Future of Health Technology Summit, Massachusetts Institute of Technology, Cambridge, MA.
- July 2011, “Magnetic Resonance”, Spintech 6 - Summer School and Conference, Matsue, Japan.
- May 2011, “Coherent-state transfer via mixed spin chains”, Difficult Problems in Quantum Information Theory, M. Keck Foundation Center for Extreme Quantum Information Theory (xQIT), Massachusetts Institute of Technology, Cambridge, MA.
- January 2011, “Ensemble Diamond Magnetometer”, 41st Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT.
- May 2010, “High-sensitivity diamond magnetometer with nanoscale resolution”, CNSI Seminar, California Nano-System Institute, University of California Santa Barbara, CA.
- May 2010, “Quantum magnetometry with NV centers in diamond”, CIFAR Program in Quantum Information, Seefeld, Austria.
- March 2010, “Quantum magnetometry”, IQuISE Offsite Meeting, MIT Endicott House, Dedham, MA
- November 2009, “High-sensitivity diamond magnetometer”, IBM Physical Sciences Colloquium, IBM TJ Watson Research Center, Yorktown Heights, NY
- March 2009, “High-sensitivity diamond magnetometer with nanoscale resolution”, APS March Meeting, Pittsburgh, PA



- February 2009, “High-sensitivity magnetometer with nanoscale resolution”, PCTS-MITRE Quantum Computation Seminar Series, Princeton, NJ.
- January 2009, “High-sensitivity diamond magnetometer with nanoscale resolution”, UMass Boston Physics Colloquium, Boston, MA.
- January 2009, “Coherent control of quantum information devices”, SISSA (International School for Advanced Studies), Trieste, Italy.
- December 2008, “Entanglement in disordered solid state spin systems: controlled realization and applications to magnetic sensing”, Solid State Quantum Information Workshop, Scuola Normale Superiore, Pisa, Italy
- November 2008, “Nanoscale spin magnetometer with quantum-limited sensitivity”, ITAMP workshop on Open quantum systems: decoherence and control, Harvard University, Cambridge, MA
- October 2008, “Quantum control of spins in diamond”, ITAMP topical group: Quantum Computing, Harvard University, Cambridge, MA
- September 2008, “Coherent control of quantum information devices”, Quantum Information Science seminar - Nuclear Science and Engineering Department, Massachusetts Institute of Technology, Cambridge, MA.
- May 2008, “High-sensitivity diamond magnetometer with nanoscale resolution”, DAMOP, meeting of the APS Division of Atomic, Molecular, and Optical Physics, State College, PA.
- April 2008, “Coherent control of quantum information”, Quantum/Nanophysics seminar, Physics Dept. - Dartmouth College, Hanover, NH.
- April 2008, “Coherent control of quantum information devices”, Rosalind Franklin Lectures, Groningen University, The Netherlands.
- January 2008, “NV centers in diamond”, Coherent Spintronics Workshop, Waterloo, ON.
- December 2007, “High-sensitivity diamond magnetometer with nanoscale resolution”, CUA Seminar, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA.
- September 2007, “Quantum control of single electron-nuclear spin registers”, Center for Astrophysics Postdoc Science Symposium, Center for Astrophysics, Cambridge, MA
- December 2006, “Quantum Information Transport in Nuclear Spin Chains” Experimental AMP Seminar, Center for Astrophysics, Cambridge, MA
- July 2006, “Control of qubits encoded in decoherence-free subspaces”, International Laser Physics Workshop, Lausanne, Switzerland.
- February 2006, “Entanglement assisted measurement of a single spin”, Joint Atomic Physics Colloquium, Harvard Physics Department, Cambridge, MA.
- January 2006, “Control of Encoded Qubits” Max-Planck-Institut für Quantenoptik, Quantum Dynamics Division Seminar, Garching, Germany.
- December 2005, “Initialization and Control of Encoded Qubits” IBM Journal Club on Fault Tolerant Computation, IBM TJ Watson Research Center, Yorktown Heights, NY
- June 2004, “Entanglement Assisted Metrology” MQC2, Macroscopic quantum coherence and computing, Naples, Italy.